AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

LISTING OF CLAIMS:

Claim 1 (Original) A method for transmitting orthogonal frequency division multiplexing (OFDM) signals, the method comprising:

(a) coding the OFDM signals;

(b) forming a block of N coded data and dividing the block into L M-sized small blocks, where N, M and L indicate integers of 1 or more, and L = N/M;

(c) M-point inverse fast Fourier transforming the L small blocks;

(d) combining L M-point inverse fast Fourier transformed blocks, and generating an N-sized inversely-transformed block;

(e) attaching a cyclic prefix to the N-sized inversely-transformed block; and

(f) transforming the blocks having the attached cyclic prefix, into an analog signal and transmitting the transformed analog signal.

Claim 2 (Original) The method of claim 1, wherein when N code data forming the one block are expressed by $X_n, where\ n = 0,1,...,N-1$, each of the L small blocks $X_v^l, where\ l = 0,1,...,L-1$, in step (b) is divided corresponding to the Equation

$$X_v^l = X_{lM+v} = X_n, n = lM + v, l = 0,1,...,L-1, v = 0,1,...,M-1,$$

and when a signal obtained by M-point inverse fast Fourier transforming the code data X_v^l of each small block, is x_m^l, the inversely-transformed blocks $x_k, where\ k = 0, 1, \ldots, N-1$, in step (d) are combined, corresponding to the Equation

$$x_k = x_{lM+m} = x_m^l, k = lM + m, l = 0, 1, \ldots, L-1, m = 0, 1, \ldots, M-1.$$

Claim 3 (Original) The method of claim 1, wherein when N code data forming the one block are expressed by $X_n, where\ n = 0, 1, \ldots, N-1$, each of the L small blocks $X_v^l, where\ l = 0, 1, \ldots, L-1$ is divided corresponding to Equation

$$X_v^l = X_{lM+v} = X_n, n = lM + v, l = 0, 1, \ldots, L-1, v = 0, 1, \ldots, M-1,$$

and when a signal obtained by M-point inverse fast Fourier transforming code data X_v^l of each small block is x_m^l, the inversely transformed block $x_k, where\ k = 0, 1, \ldots, N-1$, in step (d) is combined corresponding to the Equation

$$x_k = x_{mL+l} = x_m^l, k = mL + l, l = 0, 1, \ldots, L-1, m = 0, 1, \ldots, M-1.$$

Claim 4 (Currently Amended) A method for receiving OFDM signals, comprising:

(a) digitally converting received OFDM signals and obtaining a signal sample from the transformed signals;

(b) detecting the starting point of an N-sized signal sample block from the signal samples, and removing a cyclic prefix;

(c) dividing the signal sample block into L M-sized small blocks, where N, M and L are integers of 1 or more, and L = N/M;

(d) M-point ~~inverse~~ fast Fourier transforming the L small blocks;

(e) combining the L M-point ~~inverse~~ fast Fourier transformed small blocks, and generating an N-sized transform block; and

(f) detecting data from the N-sized transform block, and decoding the detected data.

Claim 5 (Original) The method of claim 4, wherein when N signal samples forming the signal sample block are expressed by $\omega_k, where\ k = 0,1,...,N-1$, each of the L small blocks $\omega_m^l, where\ l = 0,1,...,L-1$, is divided in correspondence to $\omega_m^l = \omega_{lM+m} = \omega_k, where\ k = lM+m, l = 0,1,...,L-1, and\ m = 0,1,...,M-1$, in step (c), and

when a signal obtained by M-point fast Fourier transforming the signal sample ω_m^l is W_v^l, the N-sized transform block $Z_n, where\ n = 0,1,..,N-1$ is coupled corresponding to $Z_n = Z_{lM+v} = W_v^l, where\ n = lM+v, l = 0,1,...L-1, and\ v = 0,1,...,M-1$, in step (e).

Claim 6 (Original) The method of claim 4, wherein when N signal samples forming the signal sample block are expressed by $\omega_k, where\ k = 0,1,..,N-1$, L small blocks $\omega_m^l, where\ l = 0,1,...,L-1$ are respectively divided in correspondence to $\omega_m^l = \omega_{mL+l} = \omega_k, where\ k = mL+l, l = 0,1,...,L-1, and\ m = 0,1,...,M-1$, in step (c), and

when a signal obtained by M-point fast Fourier transforming the signal sample ω_m^l is W_v^l, the N-sized transform block $Z_n, where\ n = 0,1,...,N-1$, is coupled in correspondence to $Z_n = Z_{lM+v} = W_v^l, where\ n = lM + v, l = 0,1,...,L-1, and\ v = 0,1,...,M-1$, in step (e).

Claim 7 (Original) The method of claim 4, between the steps (b) and (c), further comprising steps of:

(b1) N-point fast Fourier transforming the N-sized signal sample block;

(b2) compensating the distortion due to a channel by multiplying the N-point fast Fourier transformed value in step (b1) by the tap coefficients of a frequency domain equalizer; and

(b3) N-point inverse fast Fourier transforming N samples in which the distortion is compensated in step (b2).

Claim 8 (Currently Amended) An apparatus for transmitting OFDM signals, comprising:

an encoder for encoding OFDM signals;

a transmission deinterleaver for forming N encoded code data into a block, and dividing the block into L M-sized small blocks, where N, M and L are integers of 1 or more, and L=N/M;

L M-point inverse fast Fourier transformers for M-point inverse fast Fourier transforming the L small blocks;

a signal transmission interleaver for ~~coupling~~ combining L M-point inverse fast Fourier transformed small blocks, thereby generating an N-sized inverse transformed block;

a cyclic prefix adder for adding a cyclic prefix to the N-sized inversely transformed block; and

a digital-to-analog converter for analog-transforming the inversely-transformed block to which the cyclic prefix is added and transmitting the analog-transformed signal.

Claim 9 (Original) The apparatus of claim 8, wherein when N code data forming the block is expressed by $X_n, where\ n = 0,1,...,N-1$, the signal transmission deinterleaver divides each of the L small blocks $X_v^l, where\ l = 0,1,...,L-1$, in correspondence to Formula

$X_v^l = X_{lM+v} = X_n, where\ n = lM + v, l = 0,1,...,L-1, and\ v = 0,1,...,M-1$, and

when a signal obtained by M-point inverse fast Fourier transforming code data X_v^l is x_m^l, the signal transmission interleaver couples the inversely transformed block $x_k, where\ k = 0,1,...,N-1$, in correspondence to the Equation

$x_k = x_{lM+m} = x_m^l, where\ k = lM + m, l = 0,1,...,L-1, and\ m = 0,1,...,M-1$.

Claim 10 (Original) The apparatus of claim 8, wherein when N code data forming the block is expressed by $X_n, where\ n = 0,1,...,N-1$, the signal transmission deinterleaver divides each of the L small blocks $X_v^l, where\ l = 0,1,...,L-1$ in

correspondence to Formula

$X_v^l = X_{lM+v} = X_n, where\ n = lM + v, l = 0,1,...,L - 1, and\ v = 0,1,...,M - 1$, and

when a signal obtained by M-point inverse fast Fourier transforming code data X_v^l is x_m^l, the signal transmission interleaver couples the inversely transformed block $x_k, where\ k = 0,1,...,N - 1$ in correspondence to Formula

$x_k = x_{mL+l} = x_m^l, where\ k = mL + l, l = 0,1,...,L - 1, and\ m = 0,1,...,M - 1$.

Claim 11 (Original) An apparatus for receiving OFDM signals, comprising:

an analog-to-digital converter for obtaining signal samples by digital-converting received OFDM signals;

a cyclic prefix remover for finding the starting point of an N-sized signal sample block from the signal samples, and removing a cyclic prefix;

a signal receiving deinterleaver for dividing the signal sample block into L M-sized small blocks, where N, M and L are integers of 1 or more, and L = N/M;

L M-point fast Fourier transformers for M-point fast Fourier transforming the L small blocks;

a signal receiving interleaver for interleaving the L M-point fast Fourier transformed small blocks, thereby generating an N-sized transform block;

a detector for detecting data from the N-sized transform block; and

a decoder for decoding the detected data.

Claim 12 (Original) The apparatus of claim 11, wherein when N signal samples forming the signal sample block are expressed by $\omega_k, where\ k = 0,1,...,N - 1$,

the signal receiving deinterleaver divides each of the L small blocks

ω_m^l, $where\ l = 0,1,...,L-1$ in correspondence to Equation

$\omega_m^l = \omega_{lM+m} = \omega_k$, $where\ k = lM + m, l = 0,1,...,L-1, and\ m = 0,1,...,M-1$, and

when a signal obtained by M-point fast Fourier transforming signal samples ω_m^l is W_v^l, the signal receiving interleaver couples the N-sized transform block $Z_n, n = 0,1,...,N-1$ in correspondence to Formula

$Z_n = Z_{lM+v} = W_v^l$, $where\ n = lM + v, l = 0,1,...,L-1, and\ v = 0,1,...,M-1$.

Claim 13 (Original) The apparatus of claim 11, wherein when N signal samples forming the signal sample block are expressed by ω_k, $where\ k = 0,1,...,N-1$, the signal receiving deinterleaver divides each of the L small blocks

ω_m^l, $where\ l = 0,1,...,L-1$ in correspondence to Equation

$\omega_m^l = \omega_{mL+l} = \omega_k$, $where\ k = mL + l, l = 0,1,...,L-1, and\ m = 0,1,...,M-1$, and

when a signal obtained by M-point fast Fourier transforming signal samples ω_m^l is W_v^l, the signal receiving interleaver couples the N-sized transform block Z_n, $where\ n = 0,1,...,N-1$ in correspondence to Equation

$Z_n = Z_{lM+v} = W_v^l$, $where\ n = lM + v, l = 0,1,...,L-1, and\ v = 0,1,...,M-1$.

Claim 14 (Original) The apparatus of claim 11, further comprising

an N-point fast Fourier transformer for N-point fast Fourier transforming an N-sized signal sample block in which a cyclic prefix is removed by the cyclic prefix remover;

a frequency domain equalizer for compensating for the distortion caused by a channel by multiplying the values transformed by the N-point fast Fourier transformer by the tap coefficients of the frequency domain equalizer; and

an N-point inverse fast Fourier transformer for inversely transforming the N samples having distortion compensated for by the frequency domain equalizer and outputting the inversely transformed samples to the receiving deinterleaver.

Claim 15 (Original) An apparatus for transmitting OFDM signals, the apparatus comprising:

a pre-processor for encoding an input data sequence and converting the encoded data to parallel data;

a block signal domain transformer for dividing the encoded data into blocks of predetermined sizes, inserting "0" at the first data position of each block, transforming each block into a time domain signal, and combining time domain signals;

a pilot signal adder for converting pilot tones, which are to be inserted at positions other than a predetermined position among the positions at which "0" has been inserted in the block signal domain transformer, into time domain pilot signals, and adding the pilot signals to the time domain signals output by the block signal domain transformer; and

a post-processor for converting the resultant signals of the pilot signal adder to serial signals, adding a cyclic prefix to each of the converted signals, converting the resultant signals to analog signals, and transmitting the analog signals.

Claim 16 (Original) The apparatus of claim 15, wherein the block signal domain transformer comprises:

a transmission deinterleaver for dividing the encoded data into L M-sized blocks;

a "0" inserter for inserting "0" at the first position of each block;

an L×(M-IFFT) for performing inverse fast Fourier transformation on each block; and

a transmission interleaver for combining the time domain signals with each other.

Claim 17 (Original) An apparatus for receiving OFDM signals, comprising:

a pre-processor for converting a received OFDM signal to a digital signal, removing a cyclic prefix from the digital signal, converting the resultant signal to parallel signals of predetermined sizes, and transforming each of the parallel signals to a frequency domain signal;

a channel estimator for inserting virtual pilot tones at predetermined positions of the frequency domain signal, extracting the virtual pilot tones and pilot tones added upon transmission, and estimating channel characteristics from the extracted virtual pilot tones and pilot tones;

an equalizer for compensating for distortion of the output signal of the pre-processor caused by a channel, according to the estimated channel characteristics;

an intermediate processor for converting the output signal of the equalizer to a time domain signal and removing pilot signals from the time domain signal;

a signal domain transformer for transforming the output signal of the intermediate processor to a frequency domain signal; and

a post-processor for detecting transmission data from the frequency domain signal, converting the detected data to serial data, and decoding the serial data.

Claim 18 (Original) The apparatus of claim 17, wherein the channel estimator comprises:

a pilot tone extractor for extracting the pilot tones from the frequency domain signal;

a virtual pilot tone inserter for making a virtual pilot tone from the extracted pilot tones and inserting the virtual pilot tone at predetermined positions of the frequency domain signal;

a transform domain converter for fast Fourier transforming the extracted pilot tones and virtual pilot tone to a transform domain signal;

an adaptive low pass filter for removing pilot tones whose amplitudes are less than or equal to a predetermined level, among the pilot tones of the transform domain;

a "0" padder for padding positions from which pilot tones are removed with "0"; and

a frequency domain transformer for transforming the output signal of the "0" padder to a frequency domain signal.

Claim 19 (Original) The apparatus of claim 18, wherein the virtual pilot tone inserter obtains the average of the second pilot tone and the last pilot tone among

the extracted pilot tones from the pilot tone extractor and inserts the obtained average into the position of the first pilot tone.

Claim 20 (Original) The apparatus of claim 17, wherein the signal domain transformer comprises:

a receiving deinterleaver for dividing a time domain signal into L M-sized blocks;

an L×(M-FFT) for performing fast Fourier transformation on each block; and

a receiving interleaver for combining signals that have been transformed to frequency domain signals.

Claim 21 (Original) A method of transmitting OFDM signals, comprising:

(a) encoding an input data sequence, and converting encoded data to parallel data;

(b) dividing the encoded data into blocks of predetermined sizes and inserting "0" at the first position of each block;

(c) transforming each block to which "0" is inserted, to a time domain signal, and combining the time domain signals;

(d) transforming pilot tones, which are to be inserted at positions other than a predetermined position among the positions at which "0" has been inserted, into time domain pilot signals, and adding each of the pilot signals to the time domain signal of each block; and

(e) converting the resultant signal of the step (d) to a serial signal, adding a cyclic prefix to the converted signal, converting the resultant signal to an analog signal, and transmitting the analog signal.

Claim 22 (Original) The method of claim 21, wherein when the decoded data is expressed by $X_n, where\ n = 0,1,...,N-1$, the predetermined sized blocks $X_v^l, where\ l = 0,1,...,L-1\ and\ v = 0,1,...,M-1$, in step (b) are respectively divided corresponding to the Equation

$$X_v^l = X_{lM+v} = X_n, where\ n = lM + v, l = 0,1,...,L-1,\ and\ v = 0,1,...,M-1,$$

and when a time domain signal to which data X_v^l per block is converted, is x_m^l, the signals $x_k, where\ k = 0,1,...,N-1$ in step (c) are combined, corresponding to the Equation:

$$x_k = x_{lM+m} = x_m^l, where\ k = lM + m, l = 0,1,...,L-1, and\ m = 0,1,...,M-1.$$

Claim 23 (Original) The method of claim 21, wherein when the decoded data is expressed by $X_n, where\ n = 0,1,...,N-1$, each of the predetermined sized blocks $X_v^l, where\ l = 0,1,...,L-1$ is divided corresponding to the Equation:

$$X_v^l = X_{lM+v} = X_n, where\ n = lM + v, l = 0,1,...,L-1, and\ v = 0,1,...,M-1,$$

and when a time domain signal to which data X_v^l of each block is converted is x_m^l, the combined signals $x_k, k = 0,1,...,N-1$ in step (c) are combined corresponding to the Equation:

$$x_k = x_{mL+l} = x_m^l, \text{ where } k = mL + l, l = 0,1,...,L-1, \text{ and } m = 0,1,...,M-1.$$

Claim 24 (Original) A method of receiving OFDM signals, comprising:

(a) converting a received signal into a digital signal, removing a cyclic prefix from the digital signal, converting the resultant signal into parallel signals of predetermined sizes, and converting each parallel signal to a frequency domain signal;

(b) inserting a virtual pilot tone at predetermined positions of the frequency domain signal and extracting the virtual pilot tone and pilot tones added upon transmission;

(c) estimating channel characteristics from the extracted virtual pilot tone and pilot tones;

(d) compensating for distortion caused by a channel with respect to the frequency domain signal, according to the estimated channel characteristics;

(e) transforming a distortion-compensated signal into a time domain signal and removing pilot signals from the time domain signal; and

(f) detecting transmission data by transforming the resultant signals of the step (e) to a frequency domain signal, and converting the detected transmission data to serial data and decoding the serial data.

Claim 25 (Original) The method of claim 24, wherein the step (c) comprises:

(c1) inserting the virtual pilot tone at predetermined positions of the frequency domain signal;

(c2) extracting pilot tones and the virtual pilot tone from the frequency domain signal;

(c3) converting the extracted pilot tones and the extracted virtual pilot tone to a transform domain signal, and removing pilot signals in the transform domain, the amplitude of each is less than or equal to a predetermined level, among the pilot signals of the transform domain;

(c4) padding positions from which the pilot signals of the transform domain are removed, with "0"; and

(c5) transforming the resultant signal of the step (c4) to a frequency domain signal.

Claim 26 (Original) The method of claim 25, wherein the virtual pilot tone in the step (c1) is inserted at the position of the first pilot tone, and the virtual pilot tone has an amplitude which is the average of the second pilot tone and the last pilot tone among the extracted pilot tones.

Claim 27 (Original) The method of claim 24, wherein the conversion of the resultant signal of the step (e) to a frequency domain signal in step (f) comprises:

dividing the resultant signal of the step (e) into L M-sized blocks;

performing M-point fast Fourier transformation on each block; and

combining the resultant signals of the above step.

Claim 28 (Original) The method of claim 27, wherein when N signal samples forming each block are expressed by ω_k, $where\ k = 0,1,...,N-1$, each of the L blocks ω_m^l, $where\ l = 0,1,...,L-1\ and\ m = 0,1,...,M-1$, is divided in correspondence to $\omega_m^l = \omega_{lM+m} = \omega_k$, $where\ k = lM+m, l = 0,1,...,L-1, and\ m = 0,1,...,M-1$, in step (f1), and

when a signal obtained by M-point fast Fourier transforming the signal sample ω_m^l is W_v^l, the resultant signal Z_n, $where\ n = 0,1,..,N-1$, of the step (f2) is coupled corresponding to $Z_n = Z_{lM+v} = W_v^l$, $where\ n = lM+v, l = 0,1,...L-1, and\ v = 0,1,...,M-1$.

Claim 29 (Original) The method of claim 27, wherein signal samples forming each of the blocks are expressed by ω_k, $where\ k = 0,1,..,N-1$, each of the L blocks ω_m^l, $where\ l = 0,1,...,L-1,\ and\ m = 0,1,...,M-1$, is divided in correspondence to $\omega_m^l = \omega_{mL+l} = \omega_k$, $where\ k = mL+l, l = 0,1,...,L-1, and\ m = 0,1,...,M-1$, in step (f1), and

when a signal obtained by M-point fast Fourier transforming the signal sample ω_m^l is W_v^l, the resultant signal Z_n, $where\ n = 0,1,...,N-1$ of step (f3) is coupled in correspondence to $Z_n = Z_{lM+v} = W_v^l$, $where\ n = lM+v, l = 0,1,...,L-1, and\ v = 0,1,...,M-1$.